



Hermitage Park

Harts Farm Way, Havant, PO9 1HS

Construction Noise/Vibration Assessment

18th February 2022

First Issue



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Revision History

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Executive Summary and Conclusions

This document has been written to identify the level of noise and vibration impact from the proposed construction works involved with the development at Hermitage Park, Harts Farm Way, Havant, PO9 1HS, based upon noise/vibration-sensitive areas within the *Solent Wader and Brent Goose Strategy Candidate sites* and the noise limits identified by Natural England (see **Section 2.0**).

The noise assessment (**Section 3.0**) gives a positive indication that the noise limits suggested by Natural England should not be exceeded, based upon the expected equipment/activities on site.

The risk of vibration travelling over the considerable distance between the site and sensitive areas and thus causing a perceptible impact on the sensitive areas is minimal (see **Section 4.0**).

Nonetheless, PJA still recommends that a Construction Noise Management Plan is followed to ensure this is the case and to minimise noise emissions using Best Practicable Means to mitigate and offset the impact as much as is reasonably possible – suggested measures are provided in **Section 5.0**.

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1.0 Introduction

ParkerJones Acoustics Limited (PJA) has been instructed to produce a Construction Noise/Vibration Assessment for the proposed construction works involved with the development at Hermitage Park, Harts Farm Way, Havant, PO9 1HS.

This report is intended to act as an Addendum to the Construction Traffic and Environment Management Plan and the Noise Assessment submitted with the planning application. It has been produced in response to the request for additional information for Natural England.

The purpose of this report is to identify and reduce the likelihood of an adverse impact on wildlife arising from construction noise produced by the proposed development, within the *Solent Wader and Brent Goose Strategy Candidate sites* identified by Natural England.

The assessment makes reference to BS 5228:2009+A1:2014 *Code of practice for noise and vibration control on construction and open sites – Part 1: Noise*. This standard sets out a methodology for predicting noise levels arising from a wide variety of construction and related activities and contains tables of sound power levels generated by a wide variety of mobile and fixed plant equipment.

The assessment is based upon information provided by the Contractor regarding the proposed schedule of equipment that would be used on site. Source noise levels for the equipment have been based on typical noise data from BS 5228-1:2009+A1:2014.

Whilst every attempt has been made to ensure that this report communicates effectively to a reader who might not have much knowledge of acoustics, some parts are necessarily technical. A glossary of acoustic terminology and concepts is provided in **Appendix A**.

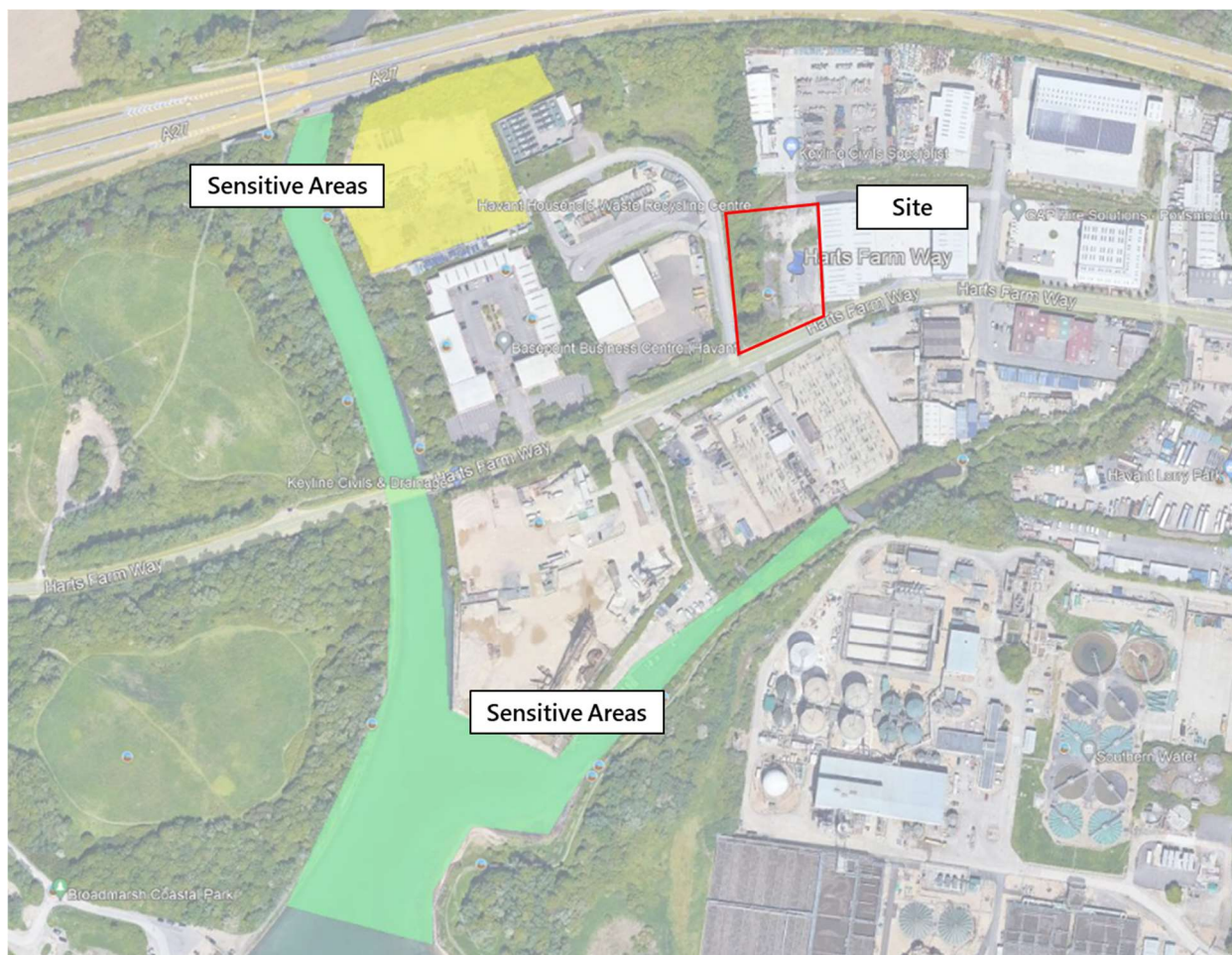
2.0 Natural England Requirements

PJA understands that whilst a full XX has been submitted with the planning application, Natural England have requested additional information:

"The proposals are adjacent to a Solent Wader and Brent Goose Strategy Candidate sites H09 (yellow) and H130 (green) and is also in close proximity to a number of other SWBGS sites. These sites support the functionality of the nearby Chichester & Langstone Harbours SPA and are therefore protected in this context. As a result, Natural England advise that best practice measures are adopted during construction to limit noise and visual disturbance to the adjacent sensitive habitat. Natural England advises that a Construction Environmental Management Plan (CEMP) should be submitted to and approved in writing by the district ecologist/biodiversity officer that identifies the steps and procedures that will be implemented to avoid or mitigate constructional impacts on the adjacent Chichester and Langstone Harbours SPA, Ramsar and the SPA's functional land mentioned above."

"The CEMP should address construction noise and vibration impacts and ensure there is no percussive piling or works with heavy machinery (i.e. plant resulting in a noise level in excess of 69dbAmax – measured at the sensitive receptor) to be undertaken during the bird overwintering period (i.e. October to March inclusive). The sensitive receptor is the nearest point of the SPA or any SPA supporting habitat (e.g. high tide roosting site)."

Figure 2.1 – Surrounding area showing the Solent Wader and Brent Goose Strategy Candidate sites



3.0 Noise Assessment

3.1 Criteria

BS 5228-1:2009+A1:2014 *Code of practice for noise and vibration control on construction and open sites – Part 1: Noise* gives recommendations for basic methods of noise control in relation to construction and open sites; predicting and measuring noise and assessing its impact on those exposed to it.

The noise level thresholds within BS 5228-1 apply to occupied 'noise-sensitive' buildings, i.e. residential properties. The most simplistic target on the exceedance of fixed noise limits at the façade of the noise-sensitive receptor. In this respect, Section E.2 of the standard states that:

"Noise should not exceed the level at which conversation in the nearest building would be difficult with the windows shut" and suggests that "noise levels, between say 07.00 and 19.00 hours, outside the nearest window of the occupied room closest to the site boundary should not exceed:

- *70 decibels (dBA) in rural, suburban and urban areas away from main road traffic and industrial noise;*
- *75 decibels (dBA) in urban areas near main roads in heavy industrial areas."*

However, it is seen in that case, that there is a lack of noise-sensitive buildings in the area. The industrial/commercial use building on the east boundary has windows on the east side of the building, away from the proposed construction works.

Therefore, the most applicable targets are seen to be those outlined by Natural England. As summarised in **Section 2.0**, construction noise levels should be managed to not exceed 69 dB(A) within the green and yellow marked areas in **Figure 2.1**.

3.2 Noise Sources

The listed sound sources in **Table 3.1** below represents the typical equipment that may be used at the site, based upon the list of activities provided by the Contactor, and the activities/equipment listed in Chapter 3 of the Construction Traffic and Environment Management Plan would be used as part of the noisiest phases of the works. The noise level data has been taken from typical levels for site operations given in Annex C of BS 5228-1:2009+A1:2014.

Table 3.1 – Construction plant/equipment and associated sound power levels and operational times

Plant/Equipment	Sound Power Level L _{WA} (dB)	Data Source/Model Name
Diggers/Excavators/Groundworks		
Tracked excavator (25 t)	105	Table C.2 Ref 19 ¹
Tracked excavator (25 t) (idling)	96	Table C.2 Ref 20 ¹
Tracked excavator (40 t)	107	Table C.2 Ref 14 ¹
Excavator mounted concrete breaker	116	Table C.5 Ref 1 ¹
Hand-held pneumatic breaker	111	Table C.1 Ref 6 ¹
Dozer (20 t)	109	Table C.2 Ref 12
Rotary bored piling – cast in situ		
Large Rotary Bored Piling Rig	111	Table C.3 Ref 14 ¹
Crane Mounter Auger	107	Table C.3 Ref 16 ¹
Mini Piling Rig	104	Table C.3 Ref 17 ¹
Compressor for Mini Piling	103	Table C.3 Ref 19 ¹
Continuous flight auger piling – cast in situ		
Crawler mounted rig (33 t)	108	Table C.3 Ref 22 ¹
Concrete works		
Concrete mixer truck (discharging)	103	Table C.4 Ref 18 ¹
Concrete mixer truck (idling)	99	Table C.4 Ref 19 ¹
Concrete pump	106	Table C.3 Ref 25 ¹
Vibratory Roller (4 t)	99	Table C.2 Ref 39 ¹
Petrol concrete cutting saw	119	Table C.4 Ref 70 ¹
Telehandlers/Loaders		
Wheeled Loader	108	Table C.2 Ref 27 ¹
Telescopic Handler (10 t)	99	Table C.2 Ref 35 ¹
Telescopic Handler (4 t)	107	Table C.4 Ref 54 ¹

Plant/Equipment	Sound Power Level L_{WA} (dB)	Data Source/Model Name
Cranes		
Tracked mobile crane (110 t)	95	Table C.2 Ref 28 ¹
Tracked mobile crane (55 t)	98	Table C.2 Ref 29 ¹
Wheeled mobile crane (70 t)	98	Table C.2 Ref 30 ¹
Mobile telescopic crane (500 t)	106	Table C.4 Ref 38 ¹
Tower crane (22 t)	104	Table C.4 Ref 48 ¹
Tracked mobile crane (105 t)	103	Table C.4 Ref 52 ¹
Dumpers		
Dumper (9 t)	104	Table C.4 Ref 4 ¹
Dumper (9 t) (idling)	91	Table C.4 Ref 5 ¹
Vehicles		
Road sweeper	104	Table C.4 Ref 90 ¹
Road lorry (empty) (39 t)	104 *	Table C.6 Ref 20 ¹
Road lorry (full) (39 t)	108 *	Table C.6 Ref 21 ¹
Small equipment/hand-held equipment		
Petrol disc cutter	107	Table C.4 Ref 72 ¹
Core drill (electric) (drilling concrete)	113	Table C.4 Ref 69 ¹
Hand-held welder	101	Table C.3 Ref 31 ¹
Lump hammer	109	Table C.1 Ref 20 ¹
NOTES: Where BS 5228-1:2009+A1:2014 presents as an A-weighted sound pressure level $L_{Aeq,T}$ at 10m, 28 dB has been added to convert to an A-weighted sound power level L_{WA}, as recommended within the standard. ¹ Table referenced from BS 5228-1:2009+A1:2014. * Drive-by maximum sound pressure		

3.3 Predicted Noise Levels

The noise predictions within this report have been undertaken using the proprietary software CadnaA® by DataKustik, a 3-D noise mapping package that implements a wide range of national and international standards, guidelines and calculation algorithms, including those set out in BS 5228-1, as detailed in **Appendix B**.

The noise model has been used to predict the resulting noise levels incident on the nearby noise-sensitive areas. 'Receiver' positions can be placed anywhere in the model to predict the noise emissions at any point. The noise contour areas plotted to represent the sensitive areas in **Figure 2.1** as well as the site itself.

Two scenarios have been modelled.

Scenario 1 has 10 no. point sources spread across the site to represent a construction site with various activities happening simultaneously, i.e. excavating, loaders, dump trucks, drilling, hammering, etc – with a sound power level of 110 dB L_{WA} per source.

This sound power is considered a worst-case for 10 sources, given that 29 of the 34 noise sources listed in **Table 3.1** have a sound power level of <110 dB, and the average sound power of **Table 3.1** is 105 dB L_{WA}.

Two of the 10 point sources are placed on the closest points of the site boundary to the sensitive areas to the south and west.

Scenario 2 has a single point source on the closest point of the south site boundary to the sensitive area to the south – the point at which the distance between the site and sensitive areas is the lowest. The point source has a sound power level of 119 dB L_{WA} and is designed as such to show the maximum source sound power that could occur without exceeding 69 dB(A) in the sensitive areas.

Both scenarios are modelled at 2m and 4m above ground. The modelling *does not* account for any screening provided by covered Heras fencing or the buildings/vehicles on the site, as a worst-case.

Table 3.2 summarises the results, with the noise maps shown in **Appendix B**.

Table 3.2 – Predicted noise emissions

Scenario	Height above ground	Highest Noise Level in the Noise-Sensitive Areas	Noise Map in Appendix B
Scenario 1 – 10 point sources at 110 dB L _{WA} each, spread across site.	2m	66 dB(A)	Figure B.2
	4m	65 dB(A)	Figure B.3
Scenario 2 – Single point sources at 119 dB L _{WA} at point where distance between the site boundary and sensitive area is the least	2m	69 dB(A)	Figure B.4
	4m	69 dB(A)	Figure B.5

3.4 Analysis

It is seen from the results of Scenario 1, which represents a worst-case scenario of 10 sources operating simultaneously at a sound power level higher than the average expected, that noise emissions to the worst-affected sensitive areas will be within the 69 dB(A) limited suggested by Natural England.

This provides a positive indication that the majority of site works, and general day-to-day activities would be capable of meeting the noise limit without any specialist mitigation measures.

Scenario 2 suggests a maximum source sound power level of **119 dB(A)**, based upon the plant/activity being right on the site boundary. In practice, this would rarely be the case.

Table 3.1 lists the three noisiest items of plant with sound power levels of 119 dB(A), 116 dB(A), and 113 dB(A), all relating to works on concrete, i.e. 'petrol concrete cutting saw', 'excavator mounted concrete breaker', and 'core drill (electric) (drilling concrete)'.

Hence this suggests that there will not be any plant/equipment at the site that would exceed 119 dB(A), and therefore the limit is unlikely to be exceeded. It is unlikely that there would be a large quantity of these noisier processes, i.e. there is unlikely to be more than 1 concrete breaker, more than 1 piling rig, etc, operating on the site at any one time.

Impact/hydraulic hammer based piling methods are likely to exceed a sound power level of 119 dB(A), i.e. pre-case concrete piling and tubular steel piling. Hence these should be avoided. The piling methods in **Table 3.1** are based upon the quieter rotary boring/continuous flight auger based methods.

Hence, in summary, the assessment gives a positive indication that the noise limits suggested by Natural England should not be exceeded, based upon the expected equipment/activities on site.

Nonetheless, PJA still recommends that a Construction Noise Management Plan is followed to ensure this is the case and to minimise noise emissions using Best Practicable Means to mitigate and offset the impact as much as is reasonably possible – suggested measures are provided in **Section 5.0**.

4.0 Vibration Assessment

Construction activities which produce moderate to high levels of vibration include heavy demolition/excavation, concrete breaking and demolition hammer usage, compaction, vibratory rollers, and vibratory or percussive methods of piling.

For piling operations, there is an extensive amount of research and measurements conducted at sites. Rotary bored piling rarely generates significant vibration effects as it does not have a percussive quality and will only generate continuous vibrations at a low level due to the steady motion of the auger.

Unfortunately, it is exceptionally difficult to predict exact levels of vibration without a very detailed study with knowledge of the foundations and the ground/soil make-up.

However, from PJA's experience of monitoring at other construction sites ¹, perceptible vibration at levels of above 1.0 mms^{-1} from a site including excavation works, rotary piling, and vibratory rolling, occurs when the receptor is within around 15 - 20m of the site.

In this case, the sensitive receptor areas are approximately 120m away.

In summary, providing the Contractor avoids using methods of percussive or vibratory piling, and instead uses rotary bored / auger based methods, the risk of vibration travelling over this considerable distance and thus causing a perceptible impact on the sensitive areas is minimal.

¹ - For example, recently at the M4/A419 J15 widening works, with monitoring conducted over 14 months at a residential property within 5m of the works to the side of the A419, which included concrete breaking works, rotary piling, and a vibratory roller.

5.0 Noise and Vibration Management

The purpose of this section is to provide a suitable Construction Noise and Vibration Management Plan which can be adopted for the site, which identifies the measures that Contractor can take to minimise the impact of noise and vibration from the proposed construction works on the sensitive areas nearby.

5.1 Mitigation Measures

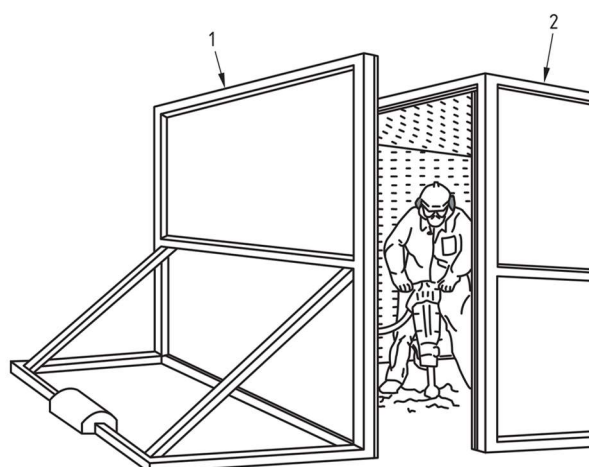
Experience from other sites has shown that by implementing the measures detailed typical noise levels from construction works can be reduced by 5-10 dB(A) or more, with noise levels from specific activities reduced by up to 15 dB(A). The adoption of Best Practicable Means is the most effective means of controlling noise from sites.

The following noise control measures will be considered.

- Local hoarding, screens or barriers will be located around particularly noisy activities (referring to temporary hoarding around stationary equipment, not the site boundary hoarding). These barriers will be constructed from common construction site materials (i.e. plywood).
 - The principles of the barriers/enclosures referenced in BS 5228-1:2009+A1:2014 (see Figure 5.1) will be followed. These can provide up to 14 dB(A) reduction at the rear of the enclosure and 10 dB(A) at the side.
 - This principle will be implemented where possible around the noisier aspects of construction, i.e. the cutting and breaking of concrete, and any equipment with a manufacturer quoted sound power level of >110 dB L_{WA}.
- The Contractor will endeavour to work with quieter machinery and processes, by:
 - using quieter processes such as:
 - bored/auger piling methods which are quieter and are less disturbing in nature opposed to impact methods which use a hydraulic impact (louder, and more disturbing from intermittent impacts);
 - It is recommended that during bored piling operations the rotary head should be lifted off with the up-most care and placed on the ground carefully to avoid any unnecessary noise and vibration impacts.
 - levered removal of concrete slabs where it is possible as an alternative to a demolition hammer.
 - using newer machinery which may be quieter from technological advancements and the lack of damaged, loose or worn components;
 - fitting noisy machinery with silencers, mufflers or enclosures where possible;
 - using electric compressors/power packs which can be significantly quieter than diesel or gasoline-powered compressors;
 - maintaining and operating plant according to the manufacturers' recommendations in such a manner as to avoid causing excessive noise (and conducting such maintenance operations will be undertaken as far away from receptors as possible).
- Plant and equipment will be sited where possible to reduce the noise impact, for example by:
 - taking advantage of site hoarding or existing structures that can act as a noise barrier;
 - facing equipment away from sensitive areas; and

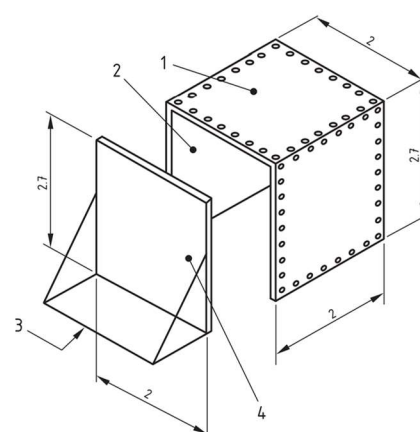
- locating plant as far away from receptors as logistically possible – i.e. concrete pumps should be able to supply concrete fill over a distance that doesn't require the plant to be right next to the pile.
- Where possible, noisy operations will be scheduled to run concurrently to take advantage of the fact that the combined noise levels may not be significantly greater than the level of operations performed separately and to minimize the total time period of exposure to high noise levels.
- Items of plant in intermittent use will be shut down in between use rather than leaving them to idle, including prohibiting delivery vehicles from waiting within site with their engines running.
- Equipment operators will be trained in noise control measures (as improper use and poor techniques can lead to increased noise levels), including the maintenance of equipment and use of silencers where possible.
- Noise from vehicles will be minimised by:
 - implementing a site speed limit of less than 10 mph and ensuring that vehicles are not unnecessarily over-revved;
 - using vehicles, plant, and equipment which are operated with closed engine covers, and fitted with effective silencers which will be regularly maintained in accordance with manufacturers' recommendations and specifications;
 - taking care when unloading or loading vehicles to minimize disturbance to local receptors, i.e. by minimizing the drop height when loading/unloading rubble;

Figure 5.1 – Local acoustic enclosure/screen – reproduced from BS 5228-1:2009+A1:2014



Key

- 1 Acoustic screen 2 m wide and 2.7 m high
- 2 Acoustic shed 2 m square and 2.7 m high



b) Open-sided shed with screen

Key

- 1 9 mm plywood outer covering on wood framework
- 2 Inner lining of 50 mm sound-absorbent material (see B.3)
- 3 Weighted or tied down
- 4 9 mm plywood screen

5.2 Management

5.2.1 Responsibilities

There shall be a trained site supervisor/manager responsible for noise reduction measures on-site at all times (during working hours). The responsibility for implementing this Construction Noise Management Plan will rest with the main Contractor. The Construction Manager will be responsible for the implementation of the plan with respect to all construction activities.

5.2.2 Complaints Procedure

Monitoring of impacts will be achieved by recording and monitoring complaints. Complaints may be reported directly to the site, via Local Environmental Health, or the Environment Agency (24-hr complaint reporting system).

Complaints records will include the following (recorded in the Site Log Book):

- date, time, and the name of the complainant (if given);
- nature of the complaint;
- the locality of complaint; and
- a summary of the investigation, the actions that were taken and the outcome.

The complaint response will have the objective of investigating the incident and preventing any continuing issue by putting in place additional control or management measures to prevent the re-occurrence of the incident. Complainants will be informed of the findings of the investigation and the actions taken. An investigation shall be instigated as soon as possible following receipt of the complaint and will include but not be limited to:

- a visit by site management to the location of the complainant to verify the issue (if the complaint is made 'after' rather than 'during' a noise event this may not be possible);
- review of site activities at the time of the incident to investigate potential sources;
- review of control measures and management actions at the time of the incident;
- review of meteorological conditions at the time of the incident; and
- reporting of findings.

Such an investigation will involve the identification and cessation of the activity or activities considered to be the cause of the complaint and/or the investigation of mitigation measures to reduce the noise emission levels from the activity or activities, for example, the replacement of noisy plant with quieter alternatives and/or the use of temporary screening. Any deviation from agreed working practices shall be identified immediately and conformance to the working practice reinstated.

If a complaint is received, an investigation shall be instigated no later than within one working day to identify the cause of the non-compliance/complaint and the Complaint Form, an example of which is shown in below, will be filled in and appropriate action will be taken to remedy the problem should the complaint be validated. Copies of the Complaints Register will be kept in a suitable binder and kept in the project office.

Table 5.1 – Complaints form

Date Received	Name and Details of Caller	Complaint/Comment/ Nature/Locality	Signature	Action Taken / Reason for any Unresolved Complaint	Date Actioned	Status Open / Closed

5.2.3 Training

The contractor's site induction program and site rules must include good working practice instructions for site staff/managers and contractors to help minimize noise and vibration whilst working on the site.

Good working practice guidance/instructions will include, but not be limited to, the following points:

- avoid unnecessary revving of engines;
- plant used intermittently to be shut-down between operational periods;
- avoid reversing wherever possible;
- drive carefully and within the site speed limit at all times; and
- report any defective equipment/plant as soon as possible so that corrective maintenance can be taken.

All personnel on-site shall understand their responsibility to ensure the generation of noise, vibration, and dust is minimised. Each employee will be made aware of the importance of noise, vibration, and dust minimization and the most effective measures available to minimise such emissions, in accordance with BS 5228:2009+A1:2014.

5.2.4 Liaison with Community and Regulators

The Site Manager (or nominated representative) will act as liaison with the regulator and local community for issues relating to noise.

The nominated representative shall respond promptly to all complaints by undertaking an investigation into the noise event, including weather conditions, operations on-site and mitigation measures in place at the time of the complaint. The representative will also inform the complainants of the outcome of the investigation.

Problems concerning noise from construction works can sometimes be avoided by taking a considerate and neighbourly approach to relations with local receptors. In order to minimize any impact upon sensitive receptors, the Contractor will actively liaise with the community. Measures such as the following will be implemented:

- Prior to undertaking works:
 - Occupiers in the vicinity who may be affected by these works shall be notified of the nature of the works, a contact name, telephone number (including that to be used outside normal working hours), and address to which any inquiries should be directed.
- Newsletters will be issued to:
 - Inform receptors of activities at the site.
 - Advise on the timing and duration of activities that may have a greater impact.
 - Inform receptors on progress at the site.
 - Inform receptors of any abnormal works.
- Appropriate signage and information boards will be displayed on site hoardings.
- A contact board will be displayed outside the site providing the following details:
 - The title 'Contract Board'.
 - Name of the main contractor, address and person to whom correspondence should be addressed.
 - Name of the site manager.

- Month and year of completion of works.
 - Names and telephone numbers of staff who can take immediate action, so that contact can be made at any time.
- The provision of a staffed telephone that is maintained at all times when site works are in progress to deal with inquiries and complaints from the local community. The telephone number (and any changes to it) shall be publicized widely in the local community affected by the works.

5.2.5 Record Keeping

The Contractor shall keep records of all noise monitoring, investigations, and complaints and these shall be made available to the local planning authority to examine on request.

Appendix A – Acoustic Terminology and Concepts

A.1 – Glossary

Table A.1 – Glossary of acoustic terminology

Term	Description
dB (decibel)	The scale on which sound pressure level is expressed. It is defined as 20 times the logarithm of the ratio of the root-mean-square pressure of the sound and a reference pressure (2×10^{-5} Pa).
dB(A)	A-weighted decibel. This is a measure of the overall level of sound across the audible spectrum with a frequency weighting (i.e. 'A' weighting) to compensate for the varying sensitivity of the human ear to sound at different frequencies.
Frequency	Sound is generally assessed over the frequency range of 63 Hz to 4000 Hz (4 kHz), although humans can potentially hear between 20 Hz and 20 kHz. Frequency is often divided into ('first') octave bands for analysis, with the range above considered within 7-octave bands with centre frequencies at 63 Hz, 125 Hz, 250 Hz, 1 kHz, 2 kHz and 4 kHz. 'Third' octave bands split this further into smaller frequency bands.
$L_{Aeq,T}$	L_{Aeq} is defined as the notional steady sound level which, over a stated period of time, would contain the same amount of acoustical energy as the A-weighted fluctuating sound measured over that period. This parameter is typically considered as a good representation of the 'average' overall noise level. It is referred to technically as the A-weighted equivalent continuous sound level and is a dB(A) as defined above.
$L_{A90,T}$	The A-weighted noise level that is exceeded for 90% of the measurement period T. This parameter is often considered as the 'average minimum level'.
$L_{Amax,T}$	The maximum A-weighted noise level during the measurement period T.

A.2 – Subjective Changes in Sound Level

Table A.2 – Subjective loudness from an increase or decrease in sound pressure level

Change in sound pressure level	Relative change in sound power energy (multiplier)		Change in apparent subjective loudness (for mid-frequency range)
	Decrease	Increase	
3 dB	1/2	2	'Just perceptible'
5 dB	1/3	3	'Clearly noticeable'
10 dB	1/10	10	'Half or twice as loud'
20 dB	1/100	100	'Much quieter, or louder'

Appendix B – Construction Noise Predictions

The noise predictions for the operational assessment within this report have been undertaken using the proprietary software CadnaA® by DataKustik, which predicts the propagation of noise levels through noise mapping and implements a wide range of national and international standards, guidelines and calculation algorithms, including those set out in BS 5228-1:2009+A1:2014.

All of the objects within the model (buildings, roads, barriers, foliage, etc) have been imported from OpenStreetMap or drawn in manually where the OSM did not contain sufficient data. The heights of the buildings and roads have been based upon Google Earth Pro, using the 3D view to be able to measure the elevation heights at the tops of objects, and then inserting this manually into the model. Lastly, the scaled site plan, floor plan, and elevation for the proposed development have been accounted for in the model.

The noise model has assumed:

- a ground absorption factor of 0 at the site and all tarmacked areas, as well as water, with greenfield land and wooded land with a factor of 1;
- a maximum reflection factor of three where buildings and barriers are assumed to have a 'smooth' reflective façade, as a worst-case;
- that noise sources do not have strong radiation patterns (in the absence of data from the manufacturer to indicate otherwise) and therefore radiate equally in all directions;
- the use of single A-weighted sound power levels (in the absence of frequency sound power level data); and
- atmospheric sound absorption based upon a temperate of 10°C and a humidity level of 70%, as per Table 2 of ISO 9613-2:1996.

The noise model has been used to predict the resulting $L_{Aeq,T}$ noise emissions from the construction works.

The images on the following pages contain screenshots of the model setup and the results of the mapping.

Figure B.1 – 3D views of the noise model setup

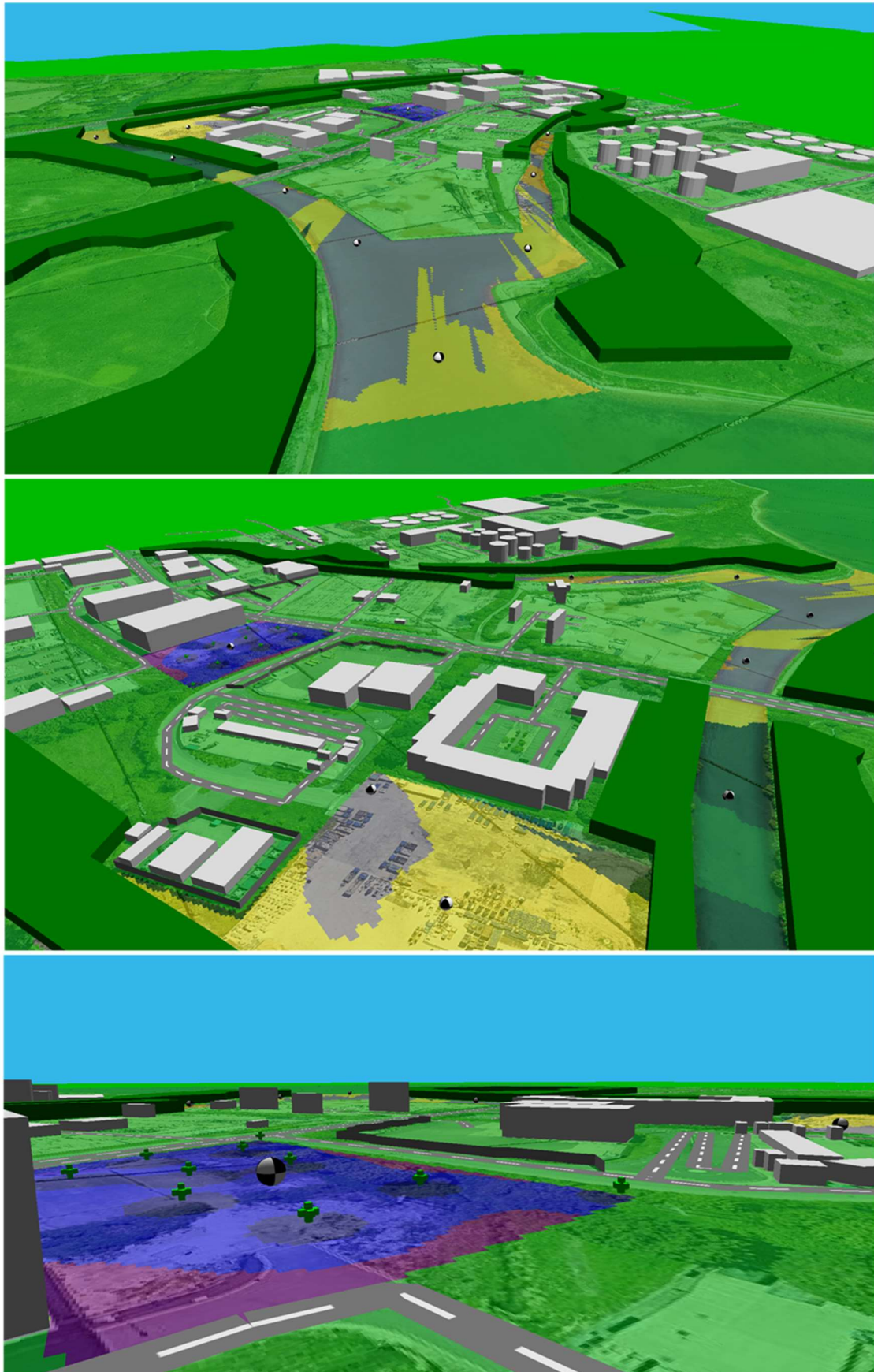


Figure B.2 – Predicted L_{Aeq} noise emissions – grid height of 2m – 10 sources operating simultaneously at 110 dB L_{WA}

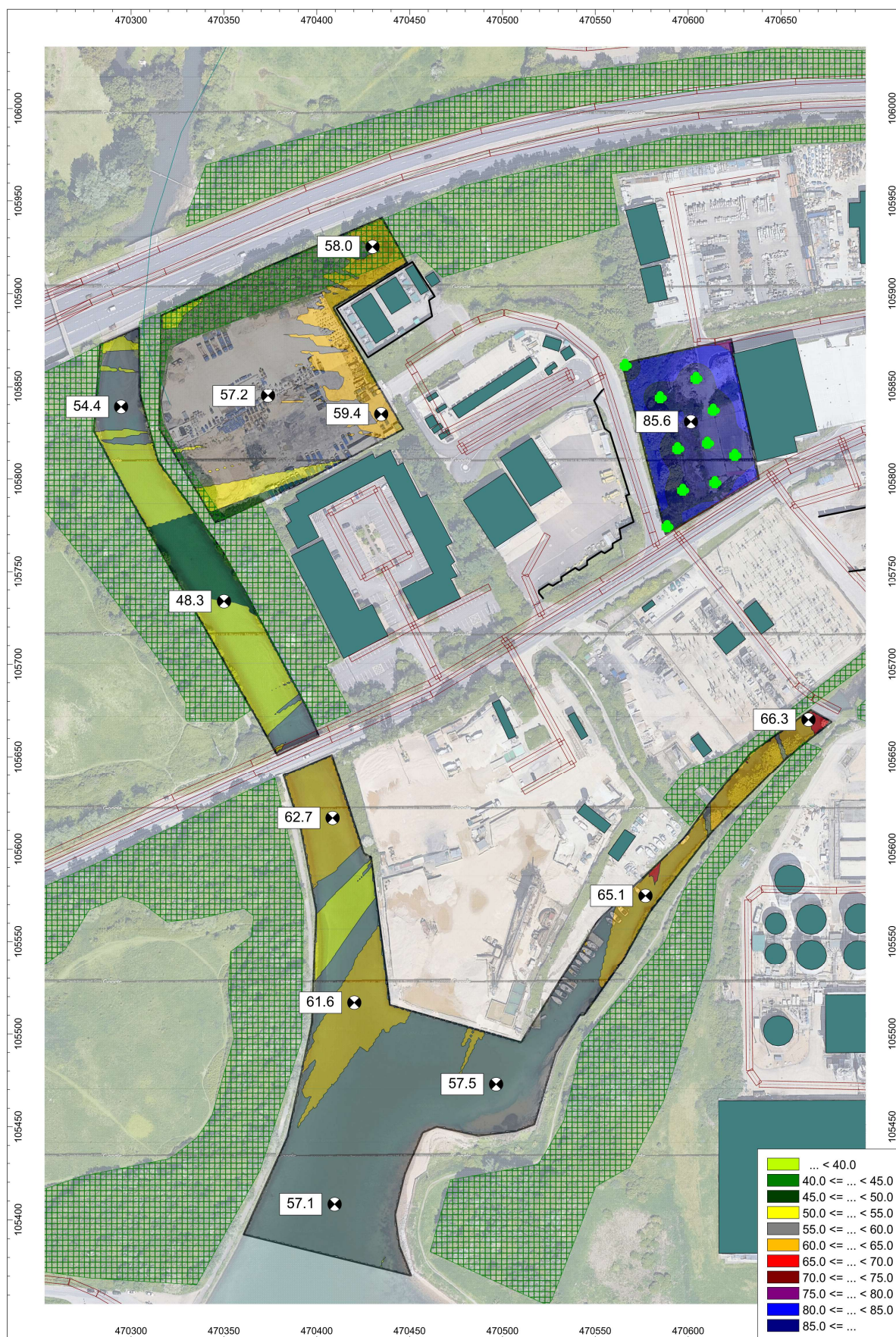


Figure B.3 – Predicted L_{Aeq} noise emissions – grid height of 4m – 10 sources operating simultaneously at 110 dB L_{WA}

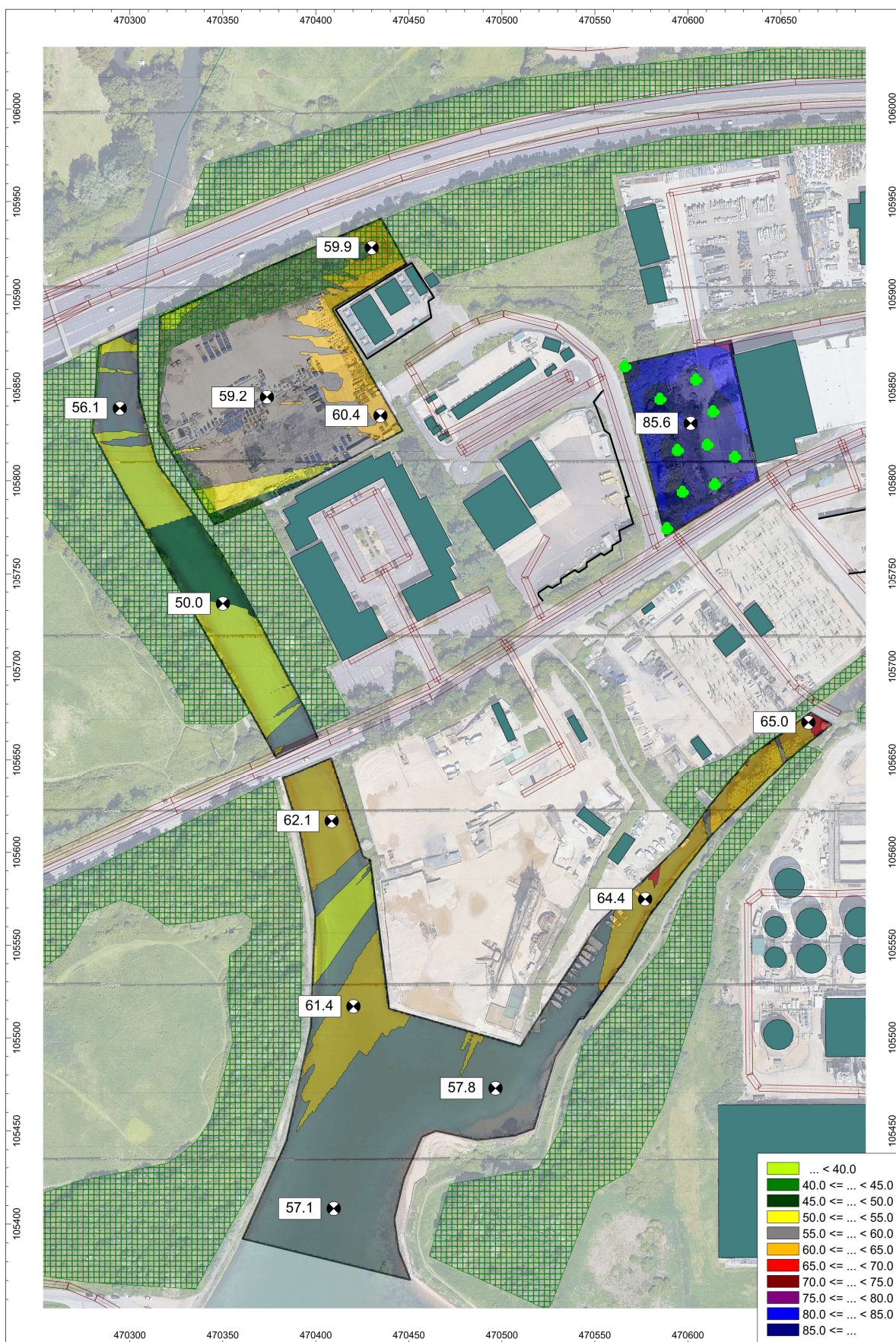


Figure B.4 – Predicted L_{Aeq} noise emissions – grid height of 2m – single source operating at 119 dB L_{WA}



Figure B.5 – Predicted L_{Aeq} noise emissions – grid height of 4m – single source operating at 119 dB L_{WA}





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